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# Building a foreign sales base: the roles of capabilities and alliances for entrepreneurial firms

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**Abstract**

This study examines how technological capabilities and international collaborative linkages affect entrepreneurial firms' abilities to build a foreign sales base in a highly competitive global industry. The empirical evidence from a sample of North American semiconductor firms indicates that both technological capabilities and international collaboration potentially aid firms' development of foreign sales. Our results also provide initial evidence that the influence of technological capabilities and international alliances differs across entrepreneurial and established firms. The paper argues that these differences are due to the dissimilar strategies and resource characteristics of entrepreneurial and established firms.


*Keywords:* Foreign sales base; Technological capabilities; Entrepreneurial firms

## 1. Executive summary

This study considers whether and how entrepreneurial businesses in high-tech industries are able to leverage their internal capabilities and utilize interfirm alliances to build a foreign sales base. Because of heightened competitive pressures, network externalities, and shrinking product life cycles, an entrepreneurial firm's success in a high-tech environment can turn on

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its capacity to rapidly develop foreign sales. As a consequence, a surprising number of new ventures, the so-called "born globals," have been able to internationalize rapidly despite resource constraints across the value chain and other administrative challenges that accompany international expansion.

This research draws upon studies in the entrepreneurship, competitive strategy, and international business literatures to examine whether technological capabilities and interfirm alliances positively shape entrepreneurial and established firms' foreign sales. Research in the field of entrepreneurship suggests that the pursuit of international sales by entrepreneurial firms is part of a broader, competitively aggressive posture that emphasizes innovativeness and risk taking. Research in international business and competitive strategy has contended that firms are at a natural disadvantage when expanding into foreign markets. Thus, valuable upstream capabilities that compensate for entrants' lack of familiarity with local market conditions are required to penetrate foreign markets. Finally, research on alliances has long contended that building foreign sales is one of the key rationales for collaborating with other firms. However, there is little empirical evidence on the outcomes of alliances in general or on entrepreneurial firms' abilities to use alliances as vehicles for foreign sales development in particular.

Beyond examining the direct effects of firms' specific capabilities and strategies, this study considers factors that may strengthen or attenuate their effects on foreign sales. Recent studies in entrepreneurship have drawn attention to the need to better understand the mechanisms through which entrepreneurial firms expand internationally, and the competitive strategy literature has also emphasized the need to examine how entrepreneurial and established firms differ in their resource profiles, competitive behaviors, and resulting performance outcomes. In response, this paper considers how the consequences of internal technological capabilities and external alliances potentially vary across entrepreneurial and other firms.

The study utilizes a sample of 101 North American semiconductor firms. A series of analyses examine the relationship among these firms' technological capabilities, international alliances in the form of nonequity and equity collaborative arrangements, and their foreign sales across five separate indicators of venture status. The evidence indicates that both technological capabilities and international alliances are strongly correlated with subsequent foreign sales. Moreover, the influence of technological capabilities remains significant after accounting for heterogeneity in a firm's resources and the configuration of its international operations. In contrast, the effects of alliances tend to vanish once one begins to address firm heterogeneity. The findings suggest that the effectiveness of international alliances hinges upon factors associated with the nature of the venture as well as the type of alliance under consideration.

For entrepreneurs in high-tech industries seeking to build a foreign sales base, the results underscore the importance of developing upstream technological capabilities. Although popular arguments tend to attach a variety of benefits to interfirm alliances, our results caution against such general conclusions absent a careful consideration of a firm's underlying capabilities. Thus, the evidence points to the need for entrepreneurs to consider carefully the balance between the risks and benefits of particular types of alliances as well as alternative mechanisms for organizing the firm's international expansion.

## 2. Introduction

The latter part of the twentieth century witnessed not only the globalization of many industries, but also the internationalization of an increasing number of entrepreneurial firms. Prior work has begun to document the internationalization of new ventures (e.g., Oviatt and McDougall, 1994; McDougall and Oviatt, 1996), but the specific means by which these firms internationalize remain unclear. The process of globalization is a difficult undertaking for firms that lack intangibles or have limited slack resources (Zacharakis, 1997), and the administrative challenges that arise from international expansion can be particularly acute for entrepreneurial firms (e.g., Fujita, 1995). Thus, despite opportunities for firms to obtain benefits such as rapid growth and future options (for a review, see Caves, 1996), it is unclear which resource and strategy configurations are most likely to enhance entrepreneurial firms' foreign sales.

In this paper, we analyze the impact of technological capabilities and alliances on the foreign sales of entrepreneurial firms. In so doing, we respond to recent calls for research on the primary firm-level factors that influence the internationalization of new ventures (e.g., Oviatt and McDougall, 1999) and on the different strategies employed by entrepreneurial and established firms (e.g., McDougall et al., 1994; Chen and Hambrick, 1995; Dean et al., 1998). Following Covin and Slevin (1989, 1990), we describe entrepreneurial firms in terms of their inclination to take on business related risks, to favor change and innovation, and to assume an aggressive competitive posture vis-à-vis their competitors. Given the context of our study in a high technology industry, we further portray entrepreneurial firms are those that face severe resource constraints arising from factors such as the possession of few tangible assets and large capital requirements.

Faced with the challenges of overcoming foreign market entry barriers, entrepreneurial firms have frequently attempted to leverage their intangible upstream capabilities by engaging in strategic alliances as a means of obtaining complementary downstream assets. The international business literature has identified a host of outcomes to alliances, which suggest that they will facilitate international expansion (e.g., Sarkar et al., 2001). Among them are the following: overcoming various resource constraints and other hurdles to international expansion (e.g., Contractor and Lorange, 1988; Hara and Kanai, 1994); acquiring country-, partner-, or task-specific knowledge (e.g., Khanna et al., 1998); improving the firm's strategic positioning (e.g., Harrigan, 1988); and achieving flexibility in uncertain environments (Kogut, 1991; Larson, 1991).

This paper addresses the apparent contradiction between traditional process theories of internationalization (e.g., Johanson and Vahlne, 1977) and the emerging literature on "born globals" (e.g., McDougall et al., 1994; Oviatt and McDougall, 1997) by exploring how differences in the capabilities possessed by entrepreneurial and established firms influence the relationship among upstream technological capabilities, international alliances, and foreign sales. The analysis is carried out in the semiconductor industry. Prior work has noted that technical progress is frequently driven by innovations created by entrepreneurial start ups in the Silicon Valley and elsewhere (e.g., Eisenhardt and Schoonhoven, 1996). Casual evidence suggests that these firms have been quite successful. For instance, small entrepreneurial firms were among the fastest growing competitors in the industry during the mid-1990s (Integrated

Circuit Engineering, 1995–1996). Moreover, with nearly two thirds of the worldwide semiconductor demand residing outside the United States (ICE, 1995–1996) and heightened competitive pressures stemming from factors such as shrinking product life cycles and the need to bring together geographically dispersed design and production skills, international expansion is a competitive priority for new ventures and established incumbents alike. Because firms in this industry exhibit substantial heterogeneity in terms of technological capabilities, alliance usage patterns, and other important characteristics (e.g., firm size and age, ownership, founder status, etc.), the industry presents an attractive research context in which to analyze how entrepreneurial firms can uniquely use their technological capabilities and alliances to realize their growth aspirations.

The following section provides background theoretical material and develops hypotheses on the determinants of foreign sales development. This section is followed by a discussion of the research methods, and we then present findings on the internationalization efforts of a sample of 101 North American semiconductor firms. The empirical evidence reveals that firms' technological capabilities and the formation of collaborative linkages are jointly associated with greater foreign sales. The results also indicate that entrepreneurial firms in the semiconductor industry have distinct technological capabilities and alliance usage patterns as compared to their counterparts. Further, the effects of technological capabilities and interfirm collaboration differ across these classes of competitors. The paper concludes with a discussion of the implications of these findings and directions for future research.

## 3. Theory and hypotheses

### *3.1. Firm capabilities*

Although prior research has drawn attention to international new ventures by bringing together literature on entrepreneurship, and international business (e.g., Oviatt and McDougall, 1994; McDougall and Oviatt, 1996), little empirical work has examined whether and how a new venture's specific resources and strategic choices influence its internationalization. For instance, while prior research has described entrepreneurial firms in terms of aggressive strategic postures, innovativeness, and risk taking (e.g., Covin and Slevin, 1990), these or other more specific characteristics have not been linked to subsequent international performance. While entrepreneurial ventures produce more innovations per employee than large firms (e.g., Acs and Audretsch, 1988), they are also likely to face growth challenges due to resource constraints. In the international context, these resource constraints extend beyond financial constraints to include administrative resource constraints arising from a lack of familiarity with local market conditions and customs in host countries.[2] This

[2] Zaheer (1995, p. 343) traces the liability of foreignness to the following four sources: (1) spatial costs due to factors such as transportation and coordination costs, (2) firm-specific costs due to unfamiliarity with the local environment, (3) host country-specific costs due to economic nationalism or a foreign firms' lack of legitimacy, and (4) home country-specific costs due to export restrictions.

"liability of foreignness" (e.g., Hymer, 1976; Zaheer and Mosakowski, 1997) implies that entrepreneurial firms must possess compensating advantages in order to compete viably in unfamiliar markets abroad.

The compensating advantages necessary to succeed in foreign markets can take many forms but are often described and analyzed in terms of intangible resources (e.g., Morck and Yeung, 1992). The general proposition that firms' capabilities affect the likelihood of successful expansion clearly cuts across other theoretical perspectives. For instance, Penrose's (1995) theory of firm growth highlights the importance of underutilized resources in prompting corporate expansion. Related research on the resource-based view of the firm (Wernerfelt, 1984; Barney, 1986; Dierickx and Cool, 1989) points to firm capabilities as fundamental to the firm's success in competing in domestic or international markets. Based on the predictions of these literatures, we expect that firms' capabilities will have an important bearing on their ability to penetrate foreign markets.

While the possession of valuable distinctive capabilities is likely to enhance a firm's ability to compete in foreign markets, the theoretical literature has yet to identify a priori the specific capabilities that most likely to lead to successful internationalization. Since the value of any capability is dependent upon the drivers of performance in that specific context, the degree to which any single capability will retain its value across different geographic markets is likely to be industry specific. The empirical analysis in this paper therefore focuses on a capability that is clearly linked to performance in the semiconductor industry. Specifically, we focus on a key measure of product performance, processing speed, which is tightly linked to the firm's technological capabilities. Products incorporating more advanced technologies can read, process, and output data more quickly than products using less sophisticated technologies. Further, more advanced technologies typically increase production yield and reduce costs (Gruber, 1994). Given the intense price- and product performance-based competition in this industry, firms with more advanced technological capabilities will likely enjoy greater success in building a foreign sales base. We therefore wish to test whether the following prediction holds for entrepreneurial firms and others:

**H1:** The firm's technological capability will positively influence its subsequent foreign sales base.

### *3.2. International alliances*

An entrepreneurial firm can also use alliances to develop its foreign sales base. By entering into strategic alliances, it can at once exploit its innovativeness as well as access financial resources and partners' complementary resources in order to expand into international markets at a smaller size than possible without the support of its partners. The international business and strategy literatures have long held that cross-border alliances can be helpful to access foreign markets (Stopford and Wells, 1972; Contractor and Lorange, 1988) and to enhance sales growth in general (e.g., Hagedoorn and Schakenraad, 1994; Powell et al., 1996). Despite this conceptual attention, comparatively little research has empirically investigated the specific benefits that firms obtain, or fail to derive, from engaging in

interfirm collaboration.[3] Indeed, as "lists" of partnering motives have lengthened, the question remains as to whether or not alliances truly deliver upon their various proposed benefits (e.g., Weaver and Dickson, 1998; Reuer and Leiblein, 2000). Moreover, even if alliances yield certain benefits to firms in general, a further question is whether entrepreneurial firms benefit more or less from alliances than established firms (e.g., Preece et al., 1999).

The literature has identified at least two mechanisms through which alliances may enhance organizational growth in general and the development of foreign sales in particular. First, alliances enable firms to acquire complementary assets and local knowledge. For entrepreneurial firms with proactive competitive strategies, this means that firms may be able to enter into a market before rivalry dissipates rents (Mitchell et al., 1994). Second, alliances can be viewed as transitional learning investments that open doors to future expansion opportunities (e.g., Reuer and Koza, 2000). Hagedoorn (1993) catalogues a number of motives for technology partnering that relate to market access and the search for new prospects. Mitchell and Singh (1992) present evidence of firms using preentry alliances as stepping stones to gain information about emerging markets before expanding on a stand-alone basis into new subfields of an industry.

While alliances in general may facilitate foreign sales development, firms use different types of alliances to meet their objectives. For example, Auster (1992) notes that firms tend to engage in international technological linkages in emerging industries, more commitment-intensive joint ventures in growth industries, and other direct investments in more mature industries. Eisenhardt and Schoonhoven (1996) report that semiconductor firms' usage of product development alliances is highest in emerging markets. Although there are many different types of alliances and there is no consensus regarding an appropriate typology, researchers commonly differentiate between nonequity and equity collaborative agreements. Nonequity alliances such as licensing or research agreements are governed solely through the use of a contract, and equity alliances afford greater control and incentive alignment through the introduction of shared ownership and a joint board (e.g., Pisano, 1989).

The fundamental differences between nonequity and equity alliances may lead to different implications for the firm's development of its foreign sales base. For instance, the emphasis on the performance of a sequence of well-defined tasks implied by a contractual nonequity agreement suggests that these types of alliances can be focused on specific objectives such as enhancing foreign sales in a particular country. However, this same focus suggests that

[3] Prior research that has considered the performance effects of alliances generally falls into one of several categories. A number of studies have examined the corporate effects of collaboration by investigating parent firms' share price reactions to alliance formation announcements (e.g., Das et al., 1998; Koh and Venkatraman, 1991). This work differs from other alliance studies measuring the current performance of the venture itself (e.g., Chowdhury, 1992; Woodcock et al., 1994). Still, another approach has been to study the effects of alliances on parent firm survival (Singh and Mitchell, 1996). This is in contrast to the more typical application of longitudinal models to study JV longevity and the determinants of venture survival (e.g., Li, 1995; Park and Ungson, 1997). Other research has considered managers' perceived satisfaction with alliances (e.g., Parkhe, 1993). Recent research has begun to narrow performance assessments by focusing on the relationship between alliances and parent firms' innovativeness as proxied by partners' patenting activities (Hagedoorn and Schakenraad, 1994; Mowery et al., 1996; Almeida et al., 1998).

nonequity alliances are less likely to provide access to the full set of supporting resources necessary to coordinate interdependent activities across countries. By contrast, the greater control and incentive alignment provided by equity alliances allow these arrangements to bring together additional value chain activities and to be used for multiple objectives (Hladik, 1985). Based on these considerations, we hypothesize that both nonequity and equity alliances will be associated with greater foreign sales development. To allow for the possibility that the effects of nonequity and equity alliances differ, we propose the following two related hypotheses.

**H2a:** The stock of a firm's international nonequity alliances will positively influence its subsequent foreign sales base.

**H2b:** The stock of a firm's international equity alliances will positively influence its subsequent foreign sales base.

### *3.3. Venture status: entrepreneurial versus established firms*

The previous hypotheses consider the impact of technological capabilities and international collaboration for entrepreneurial as well as established firms. However, the effects may well differ across these classes of firms given the underlying differences in their strategic postures and resource profiles (e.g., Hambrick et al., 1982; Woo and Cooper, 1981, 1982). For instance, to the extent that entrepreneurial firms are better able to protect an innovator's property rights, one would expect these ventures to take on greater risk and to engage in a more frequent and more radical innovative behavior. In fact, entrepreneurial firms are more likely to take on change and enter new markets in a proactive manner (e.g., Chen and Hambrick, 1995) to enjoy advantages in areas such as risk-seeking behavior (Woo, 1987) and production flexibility (Fiegenbaum and Karnanai, 1991) and to generate more patents and product innovations (Acs and Audretsch, 1988). By contrast, established firms tend to possess scale, experience, brand name advantages, and greater financial and other slack resources (e.g., Hambrick et al., 1982; Woo and Cooper, 1981).

These resource and competitive differences suggest that the relationships between firm-level capabilities and alliance strategies may differ across entrepreneurial and established firms. For instance, the tendency of new firms to lack slack resources, brand equity, distribution capacity, and developed marketing skills suggests that upstream technological capabilities will be critical for small firms seeking to develop foreign sales. By contrast, more established firms tend to possess a broader repertoire of capabilities across the value chain that can serve as compensating advantages when expanding overseas (e.g., Hitt et al., 1997).

It is also probable that the efficacy of international collaborative relationships will differ across entrepreneurial and established firms (Gomes-Casseres, 1997). For example, entrepreneurial firms are frequently required to make relationship-specific investments in order to gain access to the downstream assets held by their partners. Given the complexity of managing opportunism and other challenges in alliances (e.g., Deeds and Hill, 1999), entrepreneurial firms' lack of administrative skills and supporting resources suggests that they may benefit less

from an alliance at the margin (e.g., Niederkofler, 1991). By contrast, established firms' greater legitimacy, experience, slack financial resources, and breadth of skills across the value chain indicate greater capacity to manage a portfolio of international alliances (Hamel and Prahalad, 1994). These considerations lead us to posit the following hypotheses:

**H3:** The positive influence that technological capability has on the firm's subsequent foreign sales base will be greater for smaller firms than larger firms.

**H4a:** The positive influence that a firm's stock of international nonequity alliances has on the firm's subsequent foreign sales base will be greater for larger firms than smaller firms.

**H4b:** The positive influence that a firm's stock of international equity alliances has on the firm's subsequent foreign sales base will be greater for larger firms than smaller firms.

## 4. Methodology

### *4.1. Sample*

The sample was derived from reports provided by the ICE (1995–1996) and Dataquest consulting firms. The Dataquest reports provided data on the domestic and foreign semiconductor sales reported by 94 North American semiconductor manufacturers. These data were merged with information pertaining to 142 North American semiconductor manufacturers obtained from the 1995 to the 1996 editions of Integrated Circuit Engineering's *Profiles of IC Manufacturers and Suppliers*. Pooling of the two data sources resulted in a final sample of 101 firms. The sample represented over 60% of industry sales. Moreover, the average sales and average number of employees for our sample were statistically similar to industry averages obtained from Ward's Business Directory at the 0.05 level.

### *4.2. Model specification*

The statistical model used to test our first two hypotheses took the following form:

$$\begin{aligned}(1)\ \text{Foreign sales} = {} & \beta_0 + \beta_1\ \text{technological capability} \\ & + \beta_2\ \text{international nonequity alliances} \\ & + \beta_3\ \text{international equity alliances} + \text{controls} + \varepsilon.\end{aligned}$$

While our interest lies in developing a parsimonious model to assess the impact of technological capabilities and international alliances on the firm's foreign sales base, we introduced measures that captured the level of firms' investment in international marketing and international production to control for an organization's ability to gather information on foreign market conditions, to establish local distribution channels, to overcome local content concerns, and to signal commitment to a particular region via wholly owned operations. We

also account for the differences between entrepreneurial and established firms through the use of five separate measures of venture status. Interaction effects between venture status and technological capability as well as between venture status and the firm's international alliances were introduced to test the remaining hypotheses.

### 4.3. Measures and data

#### 4.3.1. Foreign sales

We specified a firm's foreign sales as the log of the revenue generated by sales of semiconductor products outside North America in 1996. This measure is attractive in that it provides an absolute measure of the firm's foreign market penetration and is most strongly associated with the scale advantages thought to accompany international expansion. As the measure of absolute foreign sales exhibited significant positive skew, we redefined our measure as the natural logarithm of foreign sales.

#### 4.3.2. Explanatory variables

A number of proxies for venture status have been introduced in the literature, including measures based on firm size, firm age, growth rate, founder presence, ownership structure, independence, growth orientation, innovativeness, risk preferences, and many others (e.g., Autio et al., 2000). The variety of potential proxies influenced our research design in two respects. First, the lack of a single preferred measure of venture status led us to classify the firms in our sample via a measure grounded in industry practice. Second, to address concerns regarding the validity of our industry-specific measure, we repeated our analyses using four alternative proxies commonly used in the literature. The following paragraphs describe each of the five measures of venture status used in our analysis.

The first measure is derived from a classification used by managers and consultants within the semiconductor industry to identify a firm's competitive posture (e.g., Angel, 1994). This measure, venture status small firm, classifies semiconductor firms based on annual revenue, considering firms with total annual revenues less than US$200 million as ''small.'' Many of these firms are younger rapidly growing start ups founded within areas such as the Silicon Valley or the Route 128 corridor. While the vast majority of these firms reports annual revenues substantially below the imposed revenue threshold (i.e., median U.S. and median Worldwide revenue in the sample is below US$25 million and US$33 million, respectively), the US$200 million cutoff value is used to capture all firms that focus their operations tightly around a single innovative product design or technological application. Most of these small-sized firms outsource all of their production needs.[4] In contrast, medium-sized firms such as

[4] We performed additional analyses that identified entrepreneurial firms as those in the lowest quartile of our sample in terms of annual worldwide sales. The revenue threshold implied by this criterion was US$39 million. The lowest annual revenue reported was US$1.3 million and the average annual revenue in the quartile was US$9 million. This is comparable to the average annual revenue of US$8.2 million reported in a survey taken in the late 1980s by Covin and Slevin (1989) and the range of US$500,000 to US$29 million reported in a survey of early stage ventures provided by Preece et al. (1999).

Cypress Semiconductor or LSI Logic typically maintain advanced design and fabrication capabilities and enter a limited number of product lines. During the sample time frame, large firms in the industry such as International Business Machines and Texas Instruments designed and manufactured products across a wide range of product–market applications.

Four additional proxies were developed to tie the venture status construct to the existing theory. These four measures are based on the number of employees in the firm, the age of the firm, the presence of the firm founder on the management team, and whether the firm is public or private. The employee-based measure follows a long tradition in the entrepreneurship and public policy literatures and classifies small ventures as those employing 500 or fewer individuals (e.g., Acs and Audretsch, 1988).[5] Similarly, the new venture measure identifies those firms that are relatively free from institutionalized routines, ingrained organizational structures, and large sunk investments that accrue with age. Following prior literature, we identified new ventures as those that are 8 years old or less (e.g., Biggadike, 1979; McDougall and Oviatt, 1996). The founder measure indicates whether the firm founder is a member of the current management team. A global orientation on the part of the founder has been shown to be an important predictor of early internationalization (e.g., McDougall et al., 1994), and prior research has demonstrated that measures based on founder or new venture status are highly correlated with a number of qualitative measures associated with entrepreneurial behavior including risk-taking propensity (Begley, 1995). Finally, the private measure identifies those firms that have yet to undergo an initial public offering (IPO), and therefore provides a measure that distinguishes between the legitimacy and access to external funds that are thought to accompany public firm status.

Following prior empirical research conducted on the semiconductor industry (e.g., Eisenhardt and Schoonhoven, 1996), the measure of technological capability used in this paper is derived from the minimum feature size at which a firm is a capable of manufacturing a product. Feature size represents the line width at which information is etched onto a semiconductor circuit. Smaller line widths result in lower overall production cost and greater product performance. Technological improvements tend to result in quantifiable discrete reductions in feature size. In 1988, state-of-the-art technology enabled firms to produce products with 1.0 micron feature sizes. Since then, newer generations of technology have been introduced that incorporate 0.8, 0.7, 0.5, 0.35, 0.25, and 0.18 micron technology. In order to exploit the relationship between feature size and a given generation of technology, we defined our measure of technological capability to be equal to "one" for firms using first generation 1.0 micron technology, "two" for firms using second generation 0.8 micron technology, and so on. Firms that had not adopted 1.0 micron technology as of 1995 were coded as using generation 0 technology.

The international nonequity and international equity alliance variables measure a firm's stock of active alliances with foreign partners in 1995. The international nonequity alliance measure includes licensing, codevelopment, and production agreements that include a clause-

[5] Again, we conducted analyses that identified entrepreneurial firms as those in the lowest quartile of our sample. The threshold in terms of employee count implied by this criterion was 143. The fewest number of employees reported by a firm in our sample was 17.

providing access to a foreign market. The international equity alliance measure includes agreements in which the focal firm purchases an equity position in a foreign firm or forms an equity joint venture with a foreign partner. The data on collaborative linkages enacted in any given year obtained from the profile's reports were supplemented by announcement searches conducted for each of the firms in our sample using the relevant editions of the DIALOGUE/ Predicasts F&S Index of American corporations and industries, European corporations and industries, and international corporations and industries.

*4.3.3. Control variables*

We introduced two control variables to account for factors that might affect firms' foreign sales while also being correlated with our theoretical variables. Following research demonstrating the relationship between international experience and foreign sales (e.g., Johanson and Vahlne, 1977), we accounted for firms' existing international marketing and international production investments. These variables are measured by counts of the number of marketing headquarters and number of production sites that the firm maintained in foreign markets in 1995.

## 5. Results

Table 1 presents descriptive statistics and a correlation matrix for the sampled firms. In 1996, the firms in our sample exhibited between less than 1 year and 50 years of industry experience and between US$1.3 million and US$13.5 billion in worldwide sales. Foreign sales accounted for a significant portion of these revenues, with the average firm deriving US$308 million from foreign sales. The sampled firms are rather heterogeneous in their technological capabilities, with the majority of firms utilizing second, third, fourth, or fifth generation technology. Only two firms in our sample had produced products incorporating sixth generation technology by 1996. Firms' international alliance activity was similarly

Table 1
Descriptive statistics and correlation matrix

| Variable | Mean | S.D. | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| 1. Log of foreign sales | 3.93 | 1.92 | | | | | | |
| 2. Venture status small firm | 0.62 | 0.49 | −.69*** | | | | | |
| 3. International marketing experience | 1.30 | 1.21 | .54*** | −.54*** | | | | |
| 4. International production experience | 0.37 | 1.23 | .43*** | −.30** | .14 | | | |
| 5. Technological capability | 2.38 | 1.87 | .47*** | −.35*** | .34** | .29** | | |
| 6. Nonequity alliances | 0.27 | 0.62 | .21* | −.16† | .08 | .33*** | .24** | |
| 7. Equity alliances | 0.26 | 0.72 | .36*** | −.18† | .13 | .47*** | .31** | .21* |

* $P<.05$.
** $P<.01$.
*** $P<.001$.
† $P<.10$.

varied, the primary difference being that 64% of the firms in the sample did not participate in a single international nonequity or equity alliance aimed at developing foreign sales in 1995. As expected, the smallest firms in our sample tend to have less international marketing and production experience, utilize less advanced technology, and form fewer international alliances than medium or large firms.

Table 1 also reports information regarding the relationship between each of the variables included in the analysis. The correlation matrix indicates that our measure for technological capability is strongly and positively related to foreign sales ($P<.001$). The zero-order correlations between both international nonequity alliance activity and foreign sales ($P<.05$) and international equity alliance activity and foreign sales ($P<.001$) are also positive and highly significant. The controls for international marketing and production experience are positively related to foreign sales (both $P<.001$). Many significant relationships also exist among the independent variables. For instance, firms with advanced technological capabilities tend to be active in international nonequity and equity alliances (both $P<.01$). These high-technology firms also tend to invest heavily in foreign marketing and production sites (both $P<.01$). The significant intercorrelation among these variables indicates that multivariate analyses are needed to examine the partial effects of the theoretical variables on the firm's foreign sales base.

For descriptive purposes, Table 2 provides a comparison of the small, medium, and large U.S. semiconductor firms in our sample. The left-hand column lists the variables included in the analyses. Moving from left to right, the first three data columns provide means and standard deviations, as applicable, for each of the small, medium, and large firm subsamples. The last three columns provide $t$ tests or chi-square tests for the equivalence of means across the subsamples for the continuous and indicator variables, respectively. Most significant, the results indicate that small, medium, and large firms do not differ in terms of their foreign sales intensity, which is consistent with the notion of "born globals." Roughly one third of the small firms are not publicly traded, and as expected this proportion is greater for the small than for the medium and large firms (both $P<.05$). Roughly a third of the small firms were less than 8 years old, and none of the largest firms were new ventures ($P<.05$). No differences were evident in the involvement of founders across the three subsamples.

Table 2 provides striking evidence which indicates that small firms differ dramatically from large firms in terms of international marketing experience, international production experience, technological capabilities, and their use of alliances. The relatively high-standard deviation associated with the technological capabilities of small firms suggests that some small firms have access to quite sophisticated technological capabilities. This is an interesting observation that highlights the fact that not all small firms are innovators—some may serve niche markets that do not require strong technological capabilities and others may simply lack a competitive advantage. Only those firms with advanced capabilities will be able to overcome the liability of foreignness and successfully expand abroad. Although purely descriptive, this information is suggestive of the type of resource heterogeneity that is likely to influence the ability of firms to leverage their technological capabilities and alliances when expanding overseas.

Table 2
Comparison of descriptive statistics across small-, medium-, and large-sized firms[a]

| Variable | Small mean (S.D.) | Medium mean (S.D.) | Large mean (S.D.) | Comparison $x_{small}$ to $x_{medium}$ | Comparison $x_{medium}$ to $x_{large}$ | Comparison $x_{small}$ to $x_{large}$ |
|---|---|---|---|---|---|---|
| Foreign sales intensity | 0.41 (0.27) | 0.47 (0.27) | 0.46 (0.14) | $t=-1.01$ | $t=0.11$ | $t=-0.94$ |
| U.S. sales ($ million) | 32.94 (24.58) | 203.00 (136.95) | 2,622.7 (2020.2) | $t=-6.64$*** | $t=-3.54$** | $t=-3.79$** |
| Firm tenure | 13.41 (8.42) | 17.83 (9.97) | 30.22 (13.08) | $t=-2.20$* | $t=-3.02$** | $t=-3.75$** |
| Employees[b] | 244 (171.3) | 2,152 (1,832.6) | 23,348 (17,633.8) | $t=-5.30$*** | $t=-3.39$* | $t=-3.71$** |
| New venture | 0.32 | 0.17 | 0.00 | $\chi^2=2.11$ | $\chi^2=1.78$ | $\chi^2=3.96$* |
| Founder | 0.13 | 0.10 | 0.00 | $\chi^2=0.10$ | $\chi^2=1.01$ | $\chi^2=1.29$ |
| Private | 0.35 | 0.14 | 0.00 | $\chi^2=4.37$* | $\chi^2=1.39$ | $\chi^2=4.52$* |
| International marketing experience | 0.79 (0.95) | 1.93 (1.19) | 2.78 (0.44) | $t=-4.51$*** | $t=-3.18$** | $t=-10.45$*** |
| International production experience | 0.08 (0.33) | 0.31 (1.00) | 2.56 (2.92) | $t=-1.21$ | $t=-2.47$* | $t=-2.54$* |
| Technological capability | 1.87 (1.72) | 2.62 (1.66) | 5.11 (0.60) | $t=-1.96^{\dagger}$ | $t=-6.78$*** | $t=-10.98$*** |
| Nonequity alliances | 0.19 (0.50) | 0.21 (0.62) | 1.00 (0.87) | $t=-0.44$ | $t=-3.05$** | $t=-2.74$* |
| Equity alliances | 0.16 (0.48) | 0.21 (0.49) | 1.11 (1.69) | $t=0.13$ | $t=-1.58$ | $t=-1.68$ |
| *N* | 63 | 29 | 9 | | | |

Data on number of employees were available for 57 small-, 26 medium-, and 8 large-sized firms.

[a] In constructing this table, we have followed industry norms and defined small firms to include those with worldwide sales of less than US$200 million medium-sized firms as those with worldwide sales between US$200 million and US$1 billion and large firms as those with worldwide sales in excess of US$1 billion (Angel, 1994; ICE, 1995–1996).

[b] Fisher's two-tailed exact test of homogeneity were conducted to assess the equivalence of the private, founder, and new venture variables. Two-tailed *t* tests of significance under the null that the mean difference is zero were conducted to assess the equivalence of the remaining variables.

* $P<.05$.

** $P<.01$.

*** $P<.001$.

$^{\dagger}$ $P<.10$.

### 5.1. Hypothesis testing

The regression models employed to test our hypotheses are presented in Tables 3 and 4. Table 3 reports results obtained with the annual revenue-based measure of venture status utilized by practitioners within the industry. Table 4 presents four panels that report analyses conducted with measures of venture status based on number of employees, venture age,

Table 3
Multivariate regression analyses with foreign sales as the dependent variable[a]

| Variable | Foreign sales (log of US$ million) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Model 0 | Model I | Model II | *F* statistic | Model III | *F* statistic | Model IV | *F* statistic |
| Intercept | 4.45*** | 4.06*** | 4.00*** | | 4.03*** | | 4.06** | |
| | (0.35) | (0.38) | (0.44) | | (0.38) | | (0.38) | |
| Venture status-small firm | − 1.89*** | − 1.79*** | − 1.70*** | 15.80*** | − 1.66 | 17.96*** | − 1.79*** | 15.76*** |
| | (0.32) | (0.32) | (0.48) | | (0.32) | | (0.33) | |
| International production | 0.39*** | 0.25* | 0.24† | | 0.20† | | 0.25† | |
| | (0.11) | (0.12) | (0.13) | | (0.12) | | (0.13) | |
| International marketing | 0.40** | 0.33** | 0.32** | | 0.28* | | 0.33* | |
| | (0.13) | (0.13) | (0.13) | | (0.13) | | (0.13) | |
| Technological capability | | 0.16* | 0.19 | 2.32† | 0.17* | | 0.16* | |
| | | (0.08) | (0.13) | | (0.08) | | (0.08) | |
| International nonequity alliances | | 0.01 | 0.01 | | 0.37 | 1.64 | 0.01 | |
| | | (0.22) | (0.22) | | (0.29) | | (0.22) | |
| International equity alliances | | 0.35† | 0.36† | | 0.35† | | 0.36 | 1.54 |
| | | (0.20) | (0.20) | | (0.20) | | (0.25) | |
| Venture status small firm—technological capability | | | − 0.04 | | | | | |
| | | | (0.16) | | | | | |
| Venture status small firm—international nonequity alliances | | | | | − 0.77† | | | |
| | | | | | (0.43) | | | |
| Venture status small firm—international equity alliances | | | | | | | − 0.01 | |
| | | | | | | | (0.42) | |
| Model F | 43.63*** | 24.85*** | 21.10*** | | 22.28*** | | 21.07*** | |
| Adjusted $R^2$ | .57 | .61 | .61 | | .63 | | .61 | |

[a] $N = 101$. Standard errors appear in parentheses.
* $P < .05$.
** $P < .01$.
*** $P < .001$.
† $P < .10$.

founder status, and private status, respectively. Model 0 in Table 3 provides information regarding the effects due solely to the control variables. In Table 3 and in each panel of Table 4, Model I augments the baseline control model by including the direct effects of technological capability, international nonequity alliances, and international equity alliances. Models II–IV add a series of interaction terms to examine whether the effects of the

theoretical variables vary across entrepreneurial and established ventures. Since the *t* values for the direct effect terms included in an interaction are sensitive to linear transformations of the variables (Cohen, 1978), significance levels are not reported for the direct effects of variables that also appear in interaction terms. *F* statistics are reported to indicate the overall affect of variables that also appear in interaction terms in the column to the right of each model in Table 3 and at the bottom of Table 4.

Hierarchical tests testing for the joint significance of the three theoretical variables in Model I indicates that these variables explain a significant amount of the variance in foreign sales for all analyses reported in Tables 3 and 4. Moreover, the results involving the influence of the control variables and the direct effects of technological capability and international nonequity alliances on foreign sales are robust across all models. Models II–IV further indicate that the influence of international nonequity alliances vary across small and large firms as determined by annual revenue or employee count as well as across young and old ventures as determined by the new venture status variable.

H1 predicted that a firm's technological capability positively influences its foreign sales base. The results presented in Model I of Table 3 and each of the panels in Table 4 indicate a positive and stable relationship between technological capability and foreign sales across the models with significance levels ranging from very strong ($P<.01$) to strong ($P<.05$). Analyses presented in Model III indicate that the overall influence of technological capabilities on foreign sales remains significant after accounting for potential moderation by firm size. These results provide strong support for H1.

H2a and H2b argued that firms investing in international nonequity and equity alliances are better positioned to develop their foreign sales base. While both international nonequity and international equity alliances exhibited strong zero-order correlations with foreign sales, the multivariate results presented in Tables 3 and 4 indicate that these effects are greatly diminished once these variables are jointly introduced to the model.[6] The coefficient for equity alliances is modestly significant at the .10 level in models employing the revenue and employee count measures of venture status. The coefficient for nonequity alliances fails to reach statistical significance in all models. Thus, there is a tentative support for H2b on the effects of international equity alliances. The lack of support for H2a is consistent with recent evidence presented by Preece et al. (1999, p. 271) that indicated a nonsignificant relationship between alliance formation and overseas activity in a sample of early stage technology-based firms.

The final set of hypotheses argued that the influence of technological capabilities and alliances varies across entrepreneurial firms and others. H3 stated that the influence of technological capabilities on foreign sales would be greater for entrepreneurial firms than their more established counterparts. To test this hypothesis, we estimated models incorporat-

[6] Given the positive correlation between the formation of international equity and nonequity alliances reported in Table 1, we conducted separate analyses that examined the combined effect of all international alliances. The results obtained from these tests indicated that the combined effect of international alliances on foreign sales was significant at the .05 value.

Table 4
Multivariate regression analyses with alternative measures of entrepreneurial status[a]

| Variable | Foreign sales (log of US$ million) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Employees | | | | New venture[b] | | | Founder[b] | | | Private | | | |
| | Model I | Model II | Model III | Model IV | Model I | Model II | Model IV | Model I | Model II | Model IV | Model I | Model II | Model III | Model IV |
| Intercept | 3.61*** | 3.56*** | 3.58*** | 3.70*** | 2.55*** | 2.53*** | 2.55*** | 2.34*** | 2.24*** | 2.33*** | 2.56*** | 2.43*** | 2.57*** | 2.59*** |
| | (0.36) | (0.45) | (0.36) | (0.37) | (0.28) | (0.30) | (0.28) | (0.26) | (0.26) | (0.26) | (0.37) | (0.30) | (0.29) | (0.29) |
| Venture status | − 1.42*** | − 1.35** | − 1.28*** | − 1.54*** | − 0.64† | − 0.55 | − 0.86* | − 0.32 | 0.66 | − 0.44 | − 0.62† | − 0.14 | − 0.63† | − 0.74* |
| | (0.30) | (0.50) | (0.31) | (0.32) | (0.34) | (0.49) | (0.35) | (0.46) | (0.76) | (0.50) | (0.33) | (0.48) | (0.34) | (0.35) |
| International production | 0.28* | 0.27* | 0.23† | 0.32* | 0.38** | 0.38** | 0.42** | 0.39** | 0.37** | 0.41** | 0.39** | 0.37** | 0.39** | 0.41** |
| | (0.13) | (0.13) | (0.13) | (0.13) | (0.14) | (0.14) | (0.13) | (0.14) | (0.14) | (0.14) | (0.14) | (0.14) | (0.14) | (0.14) |
| International marketing | 0.50*** | 0.49*** | 0.44*** | 0.49*** | 0.67*** | 0.67*** | 0.65*** | 0.67*** | 0.67*** | 0.68*** | 0.65*** | 0.62*** | 0.65*** | 0.64*** |
| | (0.12) | (0.12) | (0.12) | (0.12) | (0.12) | (0.13) | (0.12) | (0.13) | (0.12) | (0.13) | (0.12) | (0.13) | (0.13) | (0.12) |
| Technological capability | 0.15* | 0.17 | 0.16* | 0.13† | 0.19* | 0.20* | 0.21* | 0.22** | 0.27** | 0.23** | 0.20* | 0.27** | 0.20* | 0.19* |
| | (0.08) | (0.13) | (0.08) | (0.08) | (0.08) | (0.10) | (0.09) | (0.08) | (0.09) | (0.08) | (0.09) | (0.10) | (0.09) | (0.09) |
| International nonequity alliances | 0.01 | 0.01 | 0.36 | 0.01 | − 0.03 | − 0.04 | − 0.03 | 0.03 | 0.01 | 0.03 | 0.01 | − 0.01 | − 0.01 | 0.01 |
| | (0.22) | (0.23) | (0.31) | (0.22) | (0.25) | (0.25) | (0.24) | (0.25) | (0.25) | (0.25) | (0.25) | (0.25) | (0.26) | (0.25) |
| International equity alliances | 0.37† | 0.37† | 0.36† | 0.24 | 0.33 | 0.32 | 0.19 | 0.34 | 0.31 | 0.24 | 0.30 | 0.28 | 0.30 | 0.23 |
| | (0.21) | (0.21) | (0.21) | (0.24) | (0.23) | (0.23) | (0.23) | (0.23) | (0.23) | (0.27) | (0.22) | (0.23) | (0.23) | (0.23) |
| Venture status—technological capability | | − 0.03 | | | | − 0.05 | | | − 0.42† | | | − 0.27 | | |
| | | (0.16) | | | | (0.20) | | | (0.25) | | | (0.19) | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Venture status* international nonequity alliances | | | −0.75† (0.45) | | | | | | | | | | 0.04 (0.77) | |
| Venture status—international equity alliances | | | | −0.52 (0.46) | | | 1.91* (0.88) | | | 0.40 (0.56) | | | | 1.39 (1.06) |
| Overall *F* statistic for venture status | | 11.06*** | 12.77*** | 11.81*** | | 1.79 | 4.16* | | 1.55 | 0.48 | | 2.74† | 1.71 | 2.62† |
| Overall *F* statistic for theoretical covariate | | 1.84 | 3.27* | 2.47† | | 2.37† | 3.39* | | 4.75** | 1.30 | | 3.63* | 0.01 | 1.73 |
| Model F | 21.78*** | 18.48*** | 19.42*** | 18.89*** | 15.73*** | 13.36*** | 14.67*** | 14.74*** | 13.23*** | 13.23*** | 15.71*** | 13.89*** | 13.32*** | 13.82*** |
| $R^2$ | .58 | .58 | .59 | .59 | .50 | .50 | .53 | .48 | .50 | .50 | .50 | .51 | .50 | .51 |

[a] $N = 101$. Standard errors appear in parentheses.

[b] There were no observations that set venture status "new venture" or "founder" measures to one and engaged in an international nonequity alliance during the sample frame. Consequently, it was not possible to test models that include an interaction between international nonequity alliance and entrepreneurial status using these measures.

* $P < .05$.

** $P < .01$.

*** $P < .001$.

† $P < .10$.

ing multiplicative terms constructed between the technological capability measure and indicators of venture status. The estimated interaction effects between technological capability and venture status failed to reach significance at the .10 level in the majority of models presented in Tables 3 and 4. The lone exception was Model II in the founder panel of Table 4. However, the effect in this model was modest ($P = .08$) and indicated that the influence of technological capability on foreign sales was lower for ventures that retained their founder than others. Thus, there is no empirical support for H3, indicating that entrepreneurial firms and established firms benefit equally from upstream technological capabilities when expanding abroad.

H4a and H4b suggest that international nonequity and equity alliances will be more beneficial in generating foreign sales for larger firms than for smaller firms. Again, interaction terms are employed to test whether the effect varies with firm size. The *t* statistics for the interaction terms associated with international nonequity alliances provide modest evidence ($P < .10$) suggesting that foreign sales of smaller ventures, as measured by annual revenue or employee count, are diminished by the presence of nonequity alliances. The *t* statistics for the interaction terms associated with international equity alliances indicate ($P < .05$) that the foreign sales of younger ventures are enhanced by the presence of equity alliances. While these findings lend no support for H4a and partial support for H4b, they do provide some initial evidence that the effects of investment in international equity alliances differ across entrepreneurial and established firms.

## 6. Discussion

This study had two broad objectives. The first was to provide an empirical test of received wisdom regarding the influence of firm capabilities and international alliances on foreign sales activity. The second was to respond to recent calls for research that examines differences in the resource profiles and international expansion strategies employed by different classes of ventures (e.g., McDougall et al., 1994; Chen and Hambrick, 1995). In pursuing this second objective, our broader aim was to begin to identify some relevant contingencies that might strengthen or dampen the positive effects of alliances or technological capabilities as discussed in prior research.

This paper addresses the first of these objectives by putting to an empirical test the basic claims that distinctive capabilities and alliances facilitate expansion in general and the development of foreign sales in particular. While prior work has demonstrated that firms possessing intangible assets gain by leveraging these assets into international markets (e.g., Caves, 1996; Morck and Yeung, 1992), comparatively little is known about the specific performance implications of international alliances. This is striking given that it is often asserted that alliances provide a number of benefits to collaborators (e.g., Contractor and Lorange, 1988). We empirically examine the relationship between investment in international nonequity and equity alliances and foreign sales while controlling for the influence of technological capabilities as well as other forms of foreign direct investment.

The evidence presented in this paper confirms that both internal technological skills and externally forged relationships exhibit strong bivariate relationships with firms' subsequent foreign sales. While the influence of technological capabilities remains significant after controlling for a wide variety of firm-level characteristics, our multivariate analyses indicate that the influence of alliances diminishes in the presence of controls for venture status or other forms of foreign investment. In contrast to arguments suggesting that investment in international alliances will lead to increased foreign sales, this suggests that alliances per se are not strongly related to foreign sales. This finding cautions against attributing certain organizational outcomes to alliances without controlling for related firm characteristics and resources that might be otherwise linked to firms' decisions to invest in alliances. Future research could adopt the individual transaction as the unit of analysis in order to examine firms' individual alliance decisions, their drivers, and their consequences for entrepreneurial firms. Two-stage modeling approaches originally used in labor economics may be implemented to account not only for observed differences in firm- and transaction-level attributes leading firms to use alliances, but also for unobserved factors affecting organizational governance choices (e.g., Heckman, 1976). For instance, recent applications indicate that the relationships between foreign market entry mode and survival as well as between make versus buy choices and technological performance are due to unobserved factors associated with firms' organizational governance choices (e.g., Shaver, 1998; Leiblein et al., 2002).

This paper addresses our second objective by examining how differences in the strategies and resources of entrepreneurial and established ventures influence their abilities to exploit internal capabilities and international alliances when building a foreign sales base. The descriptive information we present shows that numerous differences exist in the resource and capability profiles of the small, medium, and large firms in our sample. While prior work has demonstrated that small firms are often more innovative than their larger competitors (e.g., Acs and Audretsch, 1988), the existence of relatively weak property rights protection in many developing countries suggests that the technological resources leveraged by smaller firms pursuing overseas expansion may be vulnerable to misappropriation (e.g., Acs et al., 1997). Similarly, while strategic alliances are likely to allow small firms and new ventures to overcome many of the entry barriers associated with foreign expansion, they do so by putting the fate of these organizations in the hands of an international partner with its own objectives. Entrepreneurial firms engaged in international collaboration therefore need to be sensitive to potential adverse selection and moral hazard problems when attempting to exchange technological capabilities for market access.

The present findings indicate the relevance of additional research on the explanatory power of the born-global view (McDougall et al., 1994) vis-à-vis perspectives emphasizing an evolutionary process of internationalization (Johanson and Vahlne, 1977). Our results indicate that small, medium, and large semiconductor firms exhibit the same level of foreign sales intensity, yet the evidence also points to the relevance of downstream assets in infrastructure such as foreign marketing and production facilities. Thus, future research might consider the relative importance of these two perspectives in different settings prone to entry by entrepreneurial firms. Rangan and Adner (2001) recently argued, for instance, that even

Internet startups may not be able to spread quickly across the world, as a born global view suggests, due to three important obstacles: potential customers must learn about these firms, users must trust the company to transact on the site, and the firm's offerings must be consistent with customers' preferences and tastes. They suggest that entrepreneurial firms will continue to benefit by succeeding at home prior to expanding abroad in a manner that accommodates local differences.

The scope and limitations of the present analysis point to a number of other areas where additional research may prove valuable. First, work is needed in other industries to test the generalizability of the findings on the roles of firm capabilities and alliances for entrepreneurial firms. For instance, Zahra et al. (2001) examine a broader cross section of new ventures from 12 different industries, and they find that overall sales growth is associated with acquisitions, licensing agreements, and export agreements. Second, since the present paper provides a cross-sectional analysis, future studies with access to primary longitudinal data may test these predictions using a dynamic framework. Third, as our focus is on the foreign sales implications of entrepreneurial firms' technological capabilities and alliances, future studies could examine other performance outcomes associated with these resources and investments. Finally, as alliances increase in number and diversity, research would be valuable on the specific implications of different alliance forms for entrepreneurial firms. Research in these directions can also provide an empirical testing ground for emerging thinking on the theory of the entrepreneurial firm and the specific implications of its changing boundaries.

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## References

Acs, Z., Audretsch, D., 1988. Innovation in large and small firms: an empirical analysis. Am. Econ. Rev. 78 (4), 678–690.

Acs, Z., Morck, R., Shaver, J.M., Yeung, B., 1997. The internationalization of small and medium-sized enterprises: a policy perspective. Small Bus. Econ. 9, 7–20.

Almeida, P., Grant, R., Song, J., 1998. Firms, alliances, and markets in cross border knowledge flow. Georgetown University (working paper).

Angel, D.P., 1994. Restructuring for Innovation: The Remaking of the US Semiconductor Industry. Guilford Press, New York.

Auster, E.R., 1992. The relationship of industry evolution to patterns of technological linkages, joint ventures, and direct investment between the U.S. and Japan. Manage. Sci. 38, 778–792.

Autio, E., Sapienza, H.J., Almeida, J.G., 2001. Effects of age at entry, knowledge intensity, and imitability on international growth. Acad. Manage. J. 43, 909–924.

Barney, J.B., 1986. Strategic factor markets: expectations, luck, and business strategy. Manage. Sci. 32, 1512–1514.

Begley, T., 1995. Using founder status, age of firm, and company growth rate as the basis for distinguishing entrepreneurs from managers of smaller businesses. J. Bus. Venturing 10, 249–263.

Biggadike, R.E., 1979. The risky business of diversification. Harvard Bus. Rev. 57, 103–111.

Caves, R.E., 1996. Multinational Enterprise and Economic Analysis, 2nd ed. Cambridge Univ. Press, New York, NY.

Chen, M.-J., Hambrick, D., 1995. Speed, stealth, and selective attack: how small firms differ from large firms in competitive behavior. Acad. Manage. J. 38 (2), 453–482.

Chowdhury, J., 1992. Performance of international joint ventures and wholly owned foreign subsidiaries: a comparative perspective. Manag. Int. Rev. 32, 115–133.

Cohen, J., 1978. Partialed products are interactions; partialed powers are curve components. Psychol. Bull. 85, 858–866.

Contractor, F.J., Lorange, P., 1988. Why should firms cooperate? The strategy and economics basis for cooperative ventures. In: Contractor, F.J., Lorange, P. (Eds.), Cooperative Strategies in International Business, D.C. Health, pp. 3–30.

Covin, J., Slevin, D., 1989. Strategic management of small firms in hostile and benign environments. Strateg. Manage. J. 10, 75–87.

Covin, J., Slevin, D., 1990. New venture strategic posture, structure, and performance: an industry life cycle analysis. J. Bus. Venturing 5, 123–135.

Das, S., Sen, P., Sengupta, S., 1998. Impact of alliances on firm valuation. Acad. Manage. J. 41, 27–41.

Dean, T.J., Brown, R.L., Bamford, C.E., 1998. Differences in large and small firm responses to environmental context: strategic implications from a comparative analysis of business formations. Strateg. Manage. J. 19 (8), 709–728.

Deeds, D.L., Hill, C.W., 1999. An examination of opportunistic action within research alliances: evidence from the biotechnology industry. J. Bus. Venturing 14 (2), 141–163.

Dierickx, I., Cool, K., 1989. Asset stock accumulation and sustainability of competitive advantage. Manage. Sci. 35, 1504–1514.

Eisenhardt, K.M., Schoonhoven, C.B., 1996. Resource-based view of alliance formation: strategic and social effects in entrepreneurial firms. Organ. Sci. 7, 136–150.

Fiegenbaum, A., Karnanai, A., 1991. Output flexibility: a competitive advantage for small firms. Strateg. Manage. J. 12, 101–114.

Fujita, M., 1995. Small and medium sized transnational corporations: trends and patterns of foreign direct investment. Small Bus. Econ. 7 (3), 183–204.

Gomes-Casseres, B., 1997. Alliance strategies of small firms. Small Bus. Econ. 9, 33–44.

Gruber, H., 1994. Learning and Strategic Product Innovation: Theory and Evidence for the Semiconductor Industry Elsevier, Amsterdam.

Hagedoorn, J., 1993. Understanding the rationale of strategic technology partnering: interorganizational modes of cooperation and sectoral differences. Strateg. Manage. J. 14, 371–385.

Hagedoorn, J., Schakenraad, J., 1994. The effect of strategic technology alliances on company performance. Strateg. Manage. J. 15, 291–309.

Hambrick, D.C., MacMillan, I.C., Day, D.L., 1982. Strategic attributes and performance in the BCG Matrix: a PIMS-based analysis of industrial product businesses. Acad. Manage. J. 25, 510–531.

Hamel, G., Prahalad, C.K., 1994. Competing for the Future. Harvard Business School Press, Boston, MA.

Hara, G., Kanai, T., 1994. Entrepreneurial networks across oceans to promote international strategic alliances for small businesses. J. Bus. Venturing 9, 489–507.

Harrigan, K.R., 1988. Joint ventures and competitive strategy. Strateg. Manage. J. 9, 141–158.
Heckman, J., 1976. The common structure of statistical models of truncation, sample selection, and limited dependent variables and a simple estimator for such models. Ann. Econ. Soc. Meas. 5 (4), 475–492.
Hitt, M.A., Hoskisson, R.E., Kim, H., 1997. International diversification: effects on innovation and firm performance in product-diversified firms. Acad. Manage. J. 40, 767–798.
Hladik, K.J., 1985. International Joint Ventures: An Economic Analysis of U.S.-Foreign Business Partnerships. Lexington Books, Lexington, MA.
Hymer, S.H., 1976. The International Operations of National Firms: A Study of Direct Investment. MIT Press, Cambridge, MA.
Integrated Circuit Engineering, 1995–1996. Profiles Reports: A Survey of Worldwide IC Manufacturers and Suppliers Integrated Circuit Engineering, Scottsdale, AZ.
Johanson, J., Vahlne, J.E., 1977. The internationalization process of a firm: a model of knowledge development and increasing foreign market commitments. J. Int. Bus. Stud. 9, 22–32.
Khanna, T., Gulati, R., Nohria, N., 1998. The dynamics of learning alliances: competition, cooperation, and relative scope. Strateg. Manage. J. 19, 193–210.
Kogut, B., 1991. Joint ventures and the option to acquire and expand. Manage. Sci. 37, 19–33.
Koh, J., Venkatraman, N., 1991. Joint venture formations and stock market reactions: an assessment of the information technology sector. Acad. Manage. J. 34, 869–892.
Larson, A., 1991. Partner networks: leveraging external ties to improve entrepreneurial performance. J. Bus. Venturing 6, 173–188.
Leiblein, M.J., Reuer, J.J., Dalsace, F., 2002. Do make or buy decisions matter? The influence of organizational governance on technological performance. Strateg. Manage. J. 23, 817–833.
Li, J., 1995. Foreign entry and survival: effects of strategic choices on performance in international markets. Strateg. Manage. J. 16, 333–351.
McDougall, P.P., Oviatt, B.M., 1996. New venture internationalization, strategic change, and performance: a follow-up study. J. Bus. Venturing 11 (1), 23–40.
McDougall, P.P., Shane, S., Oviatt, B.M., 1994. Explaining the formation of international new ventures: the limits of theories from international business research. J. Bus. Venturing 9, 469–487.
Mitchell, W., Singh, K., 1992. Incumbents' use of pre-entry alliances before expansion into new technical subfields of an industry. J. Econ. Behav. Organ. 18, 347–372.
Mitchell, W., Shaver, J.M., Yeung, B., 1994. Foreign entrant survival and foreign market share: Canadian companies' experience in United States medical sector markets. Strateg. Manage. J. 15, 555–567.
Morck, R., Yeung, B., 1992. Internalization: an event study test. J. Int. Econ. 33, 41–56.
Mowery, D.C., Oxley, D.E., Silverman, B.S., 1996. Alliances and interfirm knowledge transfer. Strateg. Manage. J. 17, 77–92 (winter special issue).
Niederkofler, M., 1991. The evolution of alliances: opportunities for managerial influence. J. Bus. Venturing 6 (4), 237–257.
Oviatt, B.M., McDougall, P.P., 1994. Toward a theory of international new ventures. J. Int. Bus. Stud. 25 (1), 45–64.
Oviatt, B.M., McDougall, P.P., 1997. Challenges for internationalization process theory: the case of international new ventures. Manag. Int. Rev. 37, 85–99.
Oviatt, B.M., McDougall, P.P., 1999. A framework for understanding accelerated international entrepreneurship. In: Rugman, A.M., Wright, R.W. (Eds.), Research in Global Strategic Management: International Entrepreneurship, Jai Press, Stamford, Ct, pp. 23–40.
Park, S.H., Ungson, G.R., 1997. The effect of national culture, organizational complementarity, and economic motivation on joint venture dissolution. Acad. Manage. J. 40, 279–307.
Parkhe, A., 1993. Alliance structuring: a game theoretic and transaction costs examination of interfirm cooperation. Acad. Manage. J. 36, 794–829.
Penrose, E.T., 1995. The Theory of the Growth of the Firm, 3rd ed. Wiley, New York, NY.

Pisano, G.P., 1989. Using equity participation to support exchange: evidence from the biotechnology industry. J. Law Econ. Organ. 5, 109–126.
Powell, W.W., Koput, K.W., Smith-Doerr, L., 1996. Interorganizational collaboration and the locus of innovation: networks of learning in biotechnology. Adm. Sci. Q. 41, 116–145.
Preece, S.B., Miles, G., Baetz, M.C., 1999. Explaining the international intensity and global diversity of early-stage technology-based firms. J. Bus. Venturing 14 (3), 259–281.
Rangan, S., Adner, R., 2001. Profits and the Internet: seven misconceptions. Sloan Manage. Rev. 42, 44–53.
Reuer, J.J., Koza, M.P., 2000. Asymmetric information and joint venture performance: theory and evidence for domestic and international joint ventures. Strateg. Manage. J. 21, 81–88.
Reuer, J.J., Leiblein, M.J., 2000. Downside risk implications of multinationality and international joint ventures. Acad. Manage. J. 43, 203–214.
Sarkar, M.B., Echambadi, R.A.J., Harrison, J.S., 2001. Alliance entrepreneurship and firm market performance. Strateg. Manage. J. 22, 701–712.
Shaver, J.M., 1998. Accounting for endogeneity when assessing strategy performance: does entry mode choice affect FDI survival? Manage. Sci. 44 (4), 571–585.
Singh, K., Mitchell, W., 1996. Precarious collaboration: business survival after partners shut down or form new partnerships. Strateg. Manage. J. 17, 99–116 (summer special issue).
Stopford, J.M., Wells, L.T., 1972. Managing the Multinational Enterprise. Basic Books, New York, NY.
Weaver, K.M., Dickson, P.H., 1998. Outcome quality of small- to medium-sized enterprise-based alliances: the role of perceived partner behaviors. J. Bus. Venturing 13 (6), 505–522.
Wernerfelt, B., 1984. A resource-based view of the firm. Strateg. Manage. J. 5, 171–180.
Woo, C.Y., 1987. Path analysis of the relationship between market share, business-level conduct and risk. Strateg. Manage. J. 8, 149–168.
Woo, C.Y., Cooper, A.C., 1981. Strategies of effective low share businesses. Strateg. Manage. J. 2, 301–318.
Woo, C.Y., Cooper, A.C., 1982. The surprising case for low market share. Harvard Bus. Rev. 59, 106–113.
Woodcock, C.P., Beamish, P.W., Makino, S., 1994. Ownership-based entry mode strategies and international performance. J. Int. Bus. Stud. 25, 253–273.
Zacharakis, A.L., 1997. Entrepreneurial entry into foreign markets: a transaction cost perspective. Entrep. Theory Pract. 21, 23–39.
Zaheer, S., 1995. Overcoming the liability of foreignness. Acad. Manage. J. 38, 341–365.
Zaheer, S., Mosakowski, E., 1997. The dynamics of the liability of foreignness: a global study of survival in financial services. Strateg. Manage. J. 18, 439–464.
Zahra, S.A., Ireland, R.D., Hitt, M.A., 2001. International expansion by new venture firms: international diversity, mode of market entry, technological learning, and performance. Acad. Manage. J. 43, 925–950.